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Age of the Springville Shale (Mississippian) of Southern Illinois

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AGE OF THE SPRINGVILLE SHALE (MISSISSIPPIAN) OF SOUTHERN ILLINOIS

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ABSTRACT

The age of the Springville Shale has long been in doubt, and the formation has been assigned at different times to either the Valmeyer or the Kinderhook Series. This report, based on study of outcrops and conodont faunas, correlates the two lowermost units of the Springville, as it was originally defined, with the Hannibal Shale and the Chouteau Limestone, both of Kinderhook age, and restricts the name Springville to beds overlying the Chouteau. A unit of soft shale at the base of the redefined Springville is proposed as the State Pond Member, and conodont faunas establish its early Valmeyer age. Because the Springville Shale is overlain by the Burlington-Keokuk Formation, it is considered equivalent to lower Osage strata.

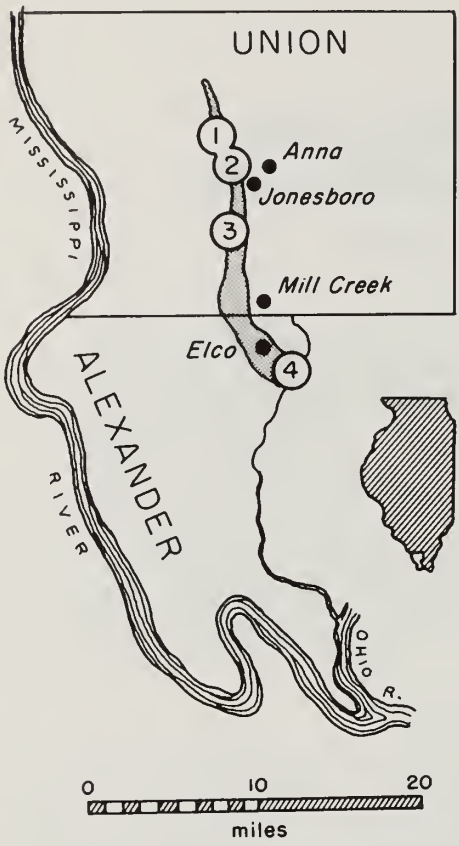
INTRODUCTION

In 1955 Collinson and R. H. Benson began the study of an ostracode fauna from the lower part of the Springville Formation of southern Illinois in an effort to confirm its preliminary correlation with a fauna from the Fern Glen Formation of Missouri. In 1957, while checking the stratigraphic position of the ostracode fauna, we compared the conodonts of the Springville with conodont faunas from numerous Devonian and Mississippian outcrops in the Mississippi Valley. The comparisons indicated that faunas of three different formations, rather than one, were present in the Springville collections, and the discovery prompted the present restudy of the Springville in order to clarify its age and stratigraphic relationships.

PREVIOUS CLASSIFICATION

Originally, the name Springville (Savage, 1920) was applied to 30 to 60 feet of greenish gray shale that overlies black fissile shale in Union and Alexander counties, Illinois. The name was taken from the now abandoned village of Springville in Union County, but today the type exposures northwest of the village site are poor. The best contemporary exposures are west of Jonesboro near the north line of sec. 23, T. 12 S., R. 2 W., near State Pond dam in sec. 14, and along Darty Creek in SW$\frac{1}{4}$ sec. 11, all mentioned in Savage's original description. Other outcrops are restricted to a narrow north-northwest trending belt in Union County and to the northeastern corner of Alexander County (fig. 1).

Savage described the Springville as unconformably overlying the black shale (then called Mountain Glen but here referred to Grassy Creek) but said



Dotted pattern indicates outcrop area of the Springville Formation

Fig. 1. - Map of Union and Alexander counties showing location of principal outcrops illustrated in figure 3.
1. Darty Creek, NW¼ SW¼ sec. 11 and SE¼ SE¼ sec. 10, T. 12 S., R. 2 W., Union County.
2. State Pond Dam, NW¼ SE¼ sec. 14, T. 12 S., R. 2 W., Union County.
3. Kornthal Church, S½ sec. 1, T. 13 S., R. 2 W., Union County.
4. Rider Hill, S½ NW¼ sec. 21, and center sec. 21, T. 14 S., R. 1 W., Alexander County.

nothing of its relationship to overlying strata. Although he discussed the Springville under the heading "Upper Devonian," he noted that at some localities the lower part contains "calcareous lenses" that yield *Productella concentrica* Hall, *Brachythyris semiplicata* Hall, *B.* cf. *B. peculiaris* (Shumard), *Ambocoelia unionensis* Weller, and *Cardiopsis* cf. *C. radiata* Meek and Worthen. These fossils, he stated, ally the formation with the Rockford (Mississippian) of Indiana.

Although the precise age of the formation has been in doubt since Savage's original description, the formation most commonly has been referred to the Kinderhook Series. Weller (1939, p. 132) noted that the limestone near the base of the Springville, which Savage referred to as calcareous lenses, "is probably the continuation of a thin limestone widely recognized in well records of the Illinois Basin and may be equivalent to the Rockford limestone of Indiana and the Louisiana limestone of northeastern Missouri." In 1940, Weller and Sutton (p. 788) tentatively correlated the Springville with the Hannibal Shale.

Weller et al. (1948, p. 153) eight years later summarized current thought on the age of the Springville as follows:

"The Springville Shale is nonfossiliferous and has been generally classed as Kinderhookian, although it might be correlated with the New Providence of Indiana. Limestone that was formerly included in the basal Springville is here distinguished as the Darty limestone, named from a triburary of Caney Creek west of Jonesboro. It is probably equivalent to the Rockford limestone of Indiana, as a thin underlying shale contains the same microfauna that is known from beneath that formation and from below the Weldon limestone in Oklahoma." In the correlation chart (Chart No. 5), the Springville Shale and Darty Limestone were shown as Kinderhookian, the New Providence as mainly Osagian. The name Darty has not been used in subsequent reports.

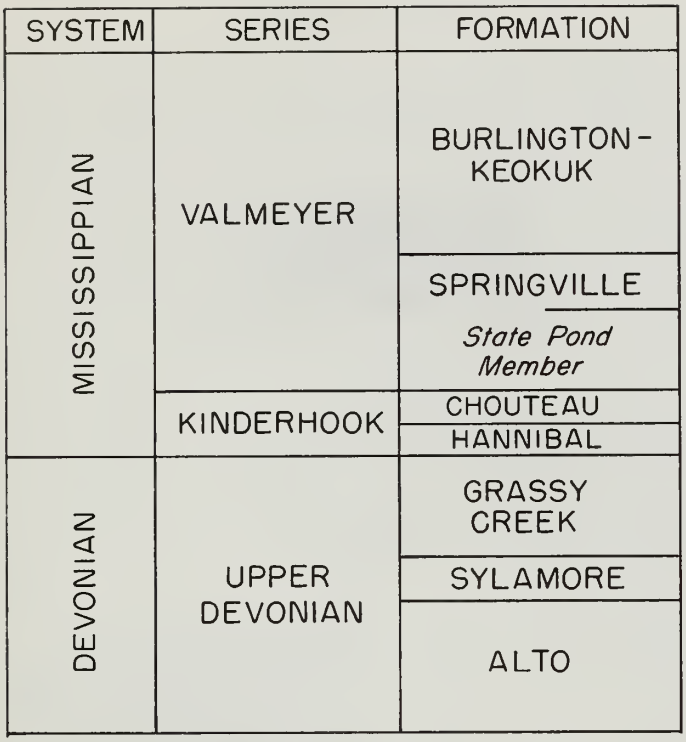


Fig. 2. - Revised classification of the Springville and its associated formations.

Correlation of the limestone lenses near the base of the Springville with the Rockford Limestone of Indiana, as suggested by Weller and Savage, was supported by Buschbach's studies in 1953. Buschbach traced the Chouteau Limestone of central western Illinois in subsurface throughout the Illinois Basin and confirmed its correlation with the Rockford. He indicated that the Chouteau extended into the Union County area but did not show its relationship to the Springville Shale.

In 1956 Workman and Gillette (fig. 18, p. 36) referred the Springville to the Osage Group (Valmeyer Series), and showed it overlying the Chouteau, thereby indirectly correlating the limestone with the Chouteau and removing it from the Springville.

Thus, prior to the present study, the limestone near the base of the Springville Shale had been accepted as Chouteau; the shale overlying the limestone had been called Osage, although no supporting evidence had been given; and the age of the gray shale beneath the limestone remained uncertain, although by implication it had been referred to the New Albany by Workman and Gillette. Some doubt remained concerning the correlation of the limestone, however, which correlation was the major reason for considering the Springville Shale to be of Valmeyer rather than Kinderhook age.

With the above facts in mind we restudied all principal outcrops of the Springville Shale in Union and Alexander counties (fig. 1) along with their fossil faunas and are proposing several changes in classification as shown in figure 2.

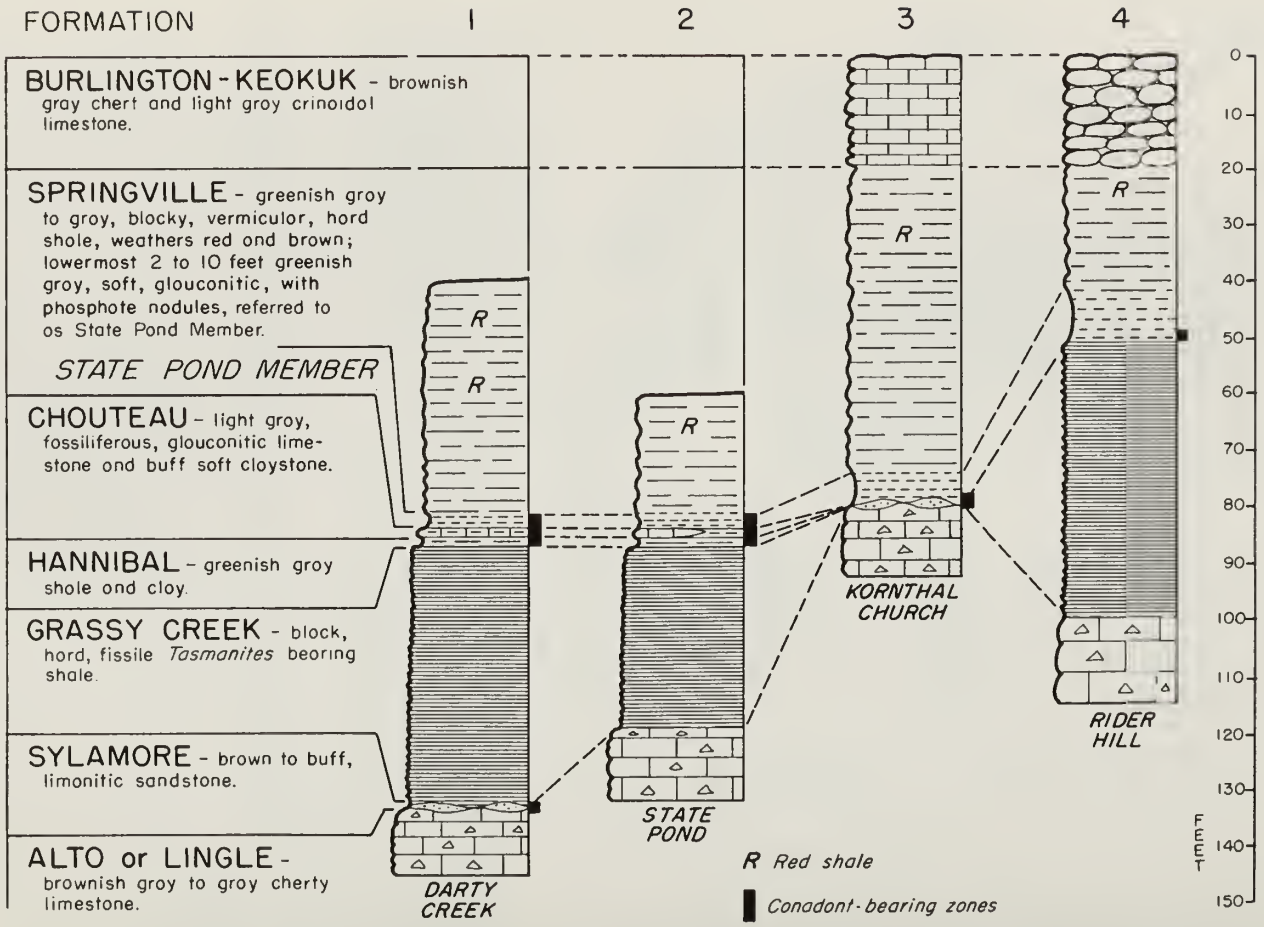


Fig. 3. - Cross section showing principal outcrops of the Springville Formation and illustrating the relationships of the formation with overlying and underlying formations. Numbers at the top of each section represent locality numbers shown in fig. 1.

OUTCROPS STUDIED

Although the Springville Shale has a limited areal extent, more than a dozen well exposed outcrops were examined. Four of these - Darty Creek, State Pond dam, Kornthal Church, and Rider Hill (figs. 1, 3, 4) - show the major relations of the various units involved and were therefore studied in detail.

Darty Creek Section. - Darty Creek is the northernmost outcrop examined (fig. 3) and was one of the sections originally studied by Savage (1920). It is exposed along Darty Creek southwestward from the NW$\frac{1}{4}$ NW$\frac{1}{4}$ SW$\frac{1}{4}$ sec. 11, to the northeast corner of the SE$\frac{1}{4}$ SE$\frac{1}{4}$ sec. 10, T. 12 S., R. 2 W., Union County. The Springville Shale is exposed at the northeast end of the section and, because the beds dip about 10 degrees eastward, the Chouteau is exposed in the creek bed about 25 yards downstream to the west. The Chouteau consists of 16 inches of brownish gray limestone, which in places has four inches of brown shale in the middle, and is overlain by 6 to 8 inches of soft greenish gray shale. Southwestward the Chouteau Limestone rises in the bluff bordering the stream. Beneath the limestone is 13 inches of greenish gray shale, which we are referring to the Hannibal, underlain by black shale of the Grassy Creek. The black shale is about 45 feet thick and is underlain by 1 to 6 inches of Sylamore Sandstone, which in turn lies on the irregular upper surface of the Alto Limestone.

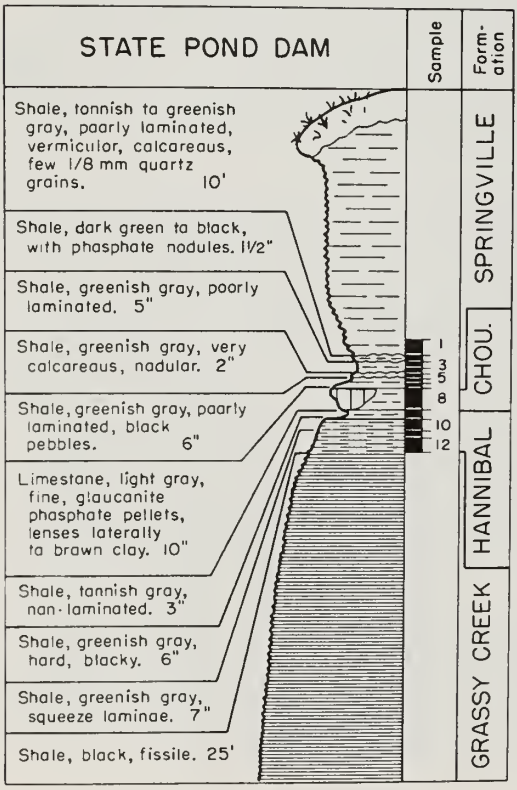
There is no evidence of unconformity either at the top or bottom of the Chouteau, nor below the greenish gray shale beneath the limestone. The irregular contact of the Sylamore on the Alto appears to represent an unconformity.

State Pond Dam Section. - The State Pond section (figs. 3, 4) is the most nearly complete exposure of early Mississippian strata in the area. The outcrop is in the south bank of the stream below the spillway of the State Pond dam in the NW$\frac{1}{4}$ SE$\frac{1}{4}$ sec. 14, T. 12 S., R. 2 W., Union County.

The lower part of the section consists of 25 feet of the Grassy Creek Shale, black and fissile, which grades upward to 16 inches of greenish gray to tannish gray shale assigned to the Hannibal. The gray shale is overlain by 10 inches of Chouteau, a light gray, fine-grained limestone that contains glauconite and phosphate pellets. The limestone thins out laterally within a few feet and is replaced by a brown to buff plastic clay of approximately the same thickness. The limestone appears to have been subject to solution, and the clay is heavily oxidized. Fourteen to fifteen inches of soft greenish shale, for which we are proposing the name State Pond Member of the Springville, overlies the limestone. The shale is calcareous in the lower part but the upper one and a half inches consists of dark green to black phosphate nodules. The soft shale is overlain by the hard tannish to greenish gray, poorly laminated shale characteristic of the upper part of the Springville. Outcrops and wells in the State Pond area indicate that the shale above the limestone attains a maximum thickness of about 60 feet.

Because of the oxidized appearance of the shales in this section, one sample from each bed (beds 1 to 12 of figure 4 plus the Grassy Creek Shale) was submitted to H. D. Glass of the Illinois State Geological Survey for determination of the clay mineralogy. His identifications, based on X-ray diffraction of oriented aggregates, are given below as approximate compositions.

Samples	Composition
Bed 1 (lowermost bed of hard upper part of Springville Shale)	Mostly unaltered illite, vermiculite-chlorite, a large amount of quartz, a small amount of calcite.
Bed 2 (top bed of State Pond Member)	Almost entirely composed of mixed-lattice minerals and montmorillonite.
Beds 3-5 (State Pond Member)	Unaltered illite, vermiculite, and small amounts of quartz and calcite.
Beds 6-8 (Chouteau and State Pond Member of Springville)	Unaltered illite, vermiculite-chlorite that is more vermiculitic than chloritic, and small amounts of quartz and calcite.
Beds 9-12 (Hannibal)	Unaltered illite, vermiculite-chlorite, and a small amount of quartz.
New Albany	Essentially unaltered illite and chlorite (ratio 3:1) plus a small amount of quartz.



Although these analyses represent only approximate compositions, the clay minerals clearly show a progressive increase in vermiculite and mixed-lattice materials from the Grassy Creek up to the top of the State Pond Member. Microscopic examination of the same samples showed a corresponding decrease in the number of calcium carbonate shells of ostracodes and brachiopods upwards in the section.

Fig. 4. - Diagram showing details of outcrops at State Pond Dam. Black areas indicate conodont-yielding samples. Samples 2-7 are referable to the State Pond Member of the Springville Formation.

For example, well preserved ostracode carapaces are fairly common in beds 11, 10, and 9 (Hannibal) but are rare in sample 8 (Chouteau) and sample 7 (lowermost bed of the State Pond) (fig. 5). In overlying beds 6 to 2, only non-

FORMATION		SPRINGVILLE							CHOU.	HANNIBAL			
STATE POND	Sample Nos.	1	2	3	4	5	6	7	8	9	10	11	12
	OSTRACODES	U						R	R	U	U	C	
	CONODONTS	U	C	C	VA	VA	VA	VA	VA	VA	U	U	U

Fig. 5. - Chart showing abundance of microfossils at State Pond Dam.

R = < 5 specimens per 1000 gm sample.
U = 30-50, A = 50-150, VA = > 150.

calcareous molds of ostracodes are found, all carbonate having been removed from the shales. A few micro-brachiopod shells were found in bed 8, but all were highly etched and unidentifiable. In addition, the number of bleached conodonts increases from bottom to top in the section. Rounded quartz grains as much as one millimeter in diameter also are present in samples 3 to 12.

Such a sequence as described above is highly suggestive of a weathering profile (H. D. Glass, personal communication) and we interpret it as such. However, to determine the geographic extent of the altered sequence, samples from the State Pond Member at Darty Creek, Kornthal Church, and Rider Hill also were X-rayed. They were found to consist mainly of unaltered illite, some vermiculite-chlorite, and a small amount of quartz, which is the composition to be expected in unweathered Springville, and there was no evidence of a weathered profile at any of the three outcrops. These facts indicate to us that the profile in the State Pond outcrop is restricted geographically to a very small area and, if a true weathering sequence, does not indicate a significant unconformity at the top of the State Pond Member. Furthermore, the sequence may not indicate an intra-Springville unconformity but may be the result of relatively recent weathering along joints or sinks. Neither can the possibility that the phenomenon is the result of groundwater percolation be discounted.

The rounded limestone lenses of the Chouteau in the State Pond outcrop may represent weathered remnants of a continuous bed. However, such severe weathering should have removed the poorly preserved micro brachiopods in the brown clay equivalent of the Chouteau. Also, the clay is as thick as the limestone, which suggests that it is not a residue from solution of the limestone. We feel it is more likely that the pinching out of the limestone is the result of deposition. The State Pond outcrop is near the depositional edge of the Chouteau (Buschbach, 1953, p. 113). The brown clay of the Chouteau is interpreted as a depositional facies of the Chouteau Limestone, and the conodont faunas lend support to this conclusion.

Kornthal Church Section. - A section four miles south-southeast of State Pond shows 60 feet of Springville Shale directly underlain by Sylamore Sand-

stone and Alto Limestone (fig. 3). The outcrops are along the right bank of Harrison Creek, beginning in the southeast corner SW$\frac{1}{4}$ sec. 1, T. 13 S., R. 2 W., and extending northeast and eastward downstream past Kornthal Church to NE$\frac{1}{4}$ SE$\frac{1}{4}$ sec 1. The westernmost and lowest part of the section is in the creek bed and consists of at least 15 feet of gray, fine-grained, hard, siliceous limestone containing buff chert nodules. The beds dip eastward 3 or 4 degrees. Downstream, 25 yards to the east, the Springville overlies one to three inches of the Sylamore Sandstone that rests on the slightly irregular surface of the Alto, which we interpret as an unconformity. The Grassy Creek Shale and the Chouteau Limestone are absent. The lower 8 to 10 feet of the Springville is soft, greenish gray shale. X-ray analyses have shown it to consist mostly of illite with some vermiculite-chlorite clay and a little quartz. The Springville is overlain by limestone of the Burlington-Keokuk Formation, which crops out at the top of the bluff south of Harrison Creek.

Rider Hill Section. - The southeasternmost outcrop of the Springville Shale is at Rider Hill, ten miles southeast of Kornthal Church. The section (fig. 3) is a composite taken from the east-west bluffs north of the road crossing the center of sec. 21, T. 14 S., R. 1 W., Alexander County, and from the outcrop exposed in the hill, center of sec. 20. In the bluffs behind the Charles I. Rider farmhouse in the southwest corner S$\frac{1}{2}$ NW$\frac{1}{4}$ sec. 21, about 50 feet of dark gray, massively bedded chert of the Burlington-Keokuk Formation overlies 25 to 30 feet of gray to buff shale assigned to the Springville. The contact between chert and shale is sharp and is marked by a 6- to 8-inch reëntrant. The uppermost 6 inches of Springville consists of gray siliceous shale with numerous pockets of greenish black pyritiferous shale containing yellow streaks. About 2 or 3 inches of relief on the contact may indicate an unconformity.

The lower contact of the Springville is exposed halfway up the south side of the isolated hill in the center of sec. 20 west of Rider Hill. The exposures show 8 to 10 feet of soft, greenish gray shale, composed mainly of illite but also containing vermiculite-chlorite and quartz, overlain by hard gray shale and underlain by approximately 50 feet of black shale of the Grassy Creek.

CONODONT FAUNAS

Conodonts are extremely abundant and widespread in rocks of late Devonian, early Mississippian, and middle Mississippian age in the Mississippi Valley region. For this reason the Illinois State Geological Survey has for several years supported continuing projects in which the evolutionary sequence and range of most of the common species have been carefully checked. Thus a comparison of Springville conodonts with faunas from the standard sections of the Mississippi Valley held promise for clarifying the age of the Springville Shale and its associated formations.

Accordingly, 3000-gram samples were collected, at both State Pond (fig. 4) and Darty Creek, from all beds lying between the black New Albany Shale and the hard siliceous upper part of the Springville Shale. The shale samples were sludged in Stoddard's solvent, and the limestone samples were digested in 10 percent acetic acid. All residues were wet-sieved and then concentrated in tetrabromoethane. Abundant collections were recovered from both outcrops. Because conclusions based on the conodonts from both outcrops were identical, we will discuss in detail only the samples from State Pond (figs. 4-6).

The list of identifiable and significant species and their known stratigraphic ranges is presented in table 1. Many species of such blade-like genera as *Hindeodella*, *Ligonodina*, and *Ozarkodina* were abundant in the samples but are not listed because their stratigraphic usefulness has not been demonstrated.

As can be seen from table 1, all samples contain high proportions of Upper Devonian species associated with forms known only from younger beds. Conodonts are resistant to solution and abrasion, so that specimens may pass through a cycle of erosion and be redeposited, producing mixed faunas. Because stratigraphic leakage from above is extremely rare, the youngest forms present generally give a true indication of the age of the containing beds. The unusually high proportion of admixed species found in the samples is somewhat misleading because the number of individuals considered indigenous is greater than that of specimens considered admixed. Faunas of Devonian age are generally more diversified and contain more species than faunas from the Mississippian - the number of described species of course being dependent on how intensively the faunas have been studied.

Conodonts are very abundant in the soft shale of the State Pond Member at the base of the Springville (samples 2-7). A few fragments were collected from sample 1, but samples of hard siliceous shale higher in the section were not reduceable. More than 27 species were identified from the State Pond Member. Of these, ten are forms not previously known above strata of Upper Devonian age and are discussed below. Five of the species found in the State Pond are known from the Chouteau and/or Hannibal elsewhere in Illinois and in Missouri, but not from younger rocks. Thus they are considered admixed. Eight of the State Pond Member species are shared by the fauna of the Fern Glen Formation at other places in Missouri and Illinois, including the type locality, and are considered indigenous. Two genera, *Bactrognathus* and *Metalonchodina*, are not known to occur below the Fern Glen and therefore are significant in establishing the early Valmeyer age of the State Pond Member.

Like the overlying Springville, the Chouteau produced abundant conodont specimens. Six of the 20 species identified in the fauna are Upper Devonian forms, and are considered admixed. Nine species are shared with faunas of the Chouteau from elsewhere in Illinois and in Missouri, and six of these species, *Ligonodina angulata*, *Polygnathus inornata*, *P. lobata*, *Siphonodella duplicata*, *S. quadruplicata*, and *Subbryantodus radians*, are not known to occur above the Sedalia.

The conodont fauna from the gray shale beneath the Chouteau at State Pond consists of 25 species. Of these, 14 are forms of Upper Devonian age and the remaining 11 are previously known from the Hannibal.

In figure 6, data from table 1 are plotted by stratigraphic unit, and the percentage of species whose ranges are known with a high degree of confidence is shown. Even though the faunas are mixed, the relative ages of the formations are clearly demonstrated.

As can be seen from the graphs, Devonian species are present in all samples at State Pond. They are of special interest because these admixtured elements are characteristic middle Upper Devonian forms.

After detailed study of the conodonts from the Darty Creek and State Pond dam localities, samples also were collected from the Springville Shale at Rider Hill and Kornthal Church and examined for conodonts. Neither locality yielded conodonts in sufficient quantity to indicate the age of the shale.

Table 1. - Occurrence of Common Significant Species at State Pond Dam and Their Known Stratigraphic Ranges.

Range of species						Occurrence of species											
							Springville							Chouteau		Hannibal		
Fern Glen	Sedalia	Chouteau	Hannibal	U. Devonian	Conodont species found at State Pond locality		State Pond											
						Sample numbers:	1	2	3	4	5	6	7	8L	8S	9	10	11
X	-	-	-	-	Bactrognathus perplana Mehl & Thomas		-	-	-	-	-	X	X	-	-	-	-	-
X	-	-	-	-	B. spp.		-	-	-	-	-	X	X	-	-	-	-	-
-	-	-	-	X	Ctenopolygnathus brevilaminata (B. & M.)		-	-	-	-	-	-	-	-	-	M	-	M
X	X	X	X	-	Gnathodus delicatus B. & M.		-	-	-	-	-	X	X	X	X	X	-	X
-	-	X	X	-	G. perplexus B. & M.		-	-	-	-	-	-	-	X	X	X	-	-
-	X	-	-	-	G. sp.		-	-	-	-	-	X	X	-	-	-	-	-
-	-	X	-	-	Ligonodina angulata B. & M.		-	-	-	-	-	-	-	X	-	-	-	-
-	-	-	-	X	L. robusta B. & M.		-	-	-	-	-	-	-	-	-	M	-	-
X	-	-	-	-	Metalonchodina n. sp.		-	-	X	-	-	-	-	-	-	-	-	-
-	-	-	-	X	Neoprioniodus alatus (Hinde)		-	-	M	-	-	M	M	-	M	M	M	M
X	X	X	X	-	N. barbatus (B. & M.)		-	-	-	-	-	X	X	X	-	-	-	-
-	-	-	X	X	N. prona (Huddle)		-	-	-	-	-	-	-	-	-	M	-	-
-	-	-	-	X	Palmatalepis distorta B. & M.		-	-	-	-	-	-	-	-	-	M	-	-
-	-	-	-	X	P. glabra U. & B.		-	M	M	-	-	M	M	M	M	M	M	M
-	-	-	-	X	P. ? irregularis Thomas		-	-	-	-	-	-	-	-	-	M	-	-
-	-	-	-	X	P. perlobata U. & B.		-	-	-	-	-	M	M	M	M	-	M	M
-	-	-	-	X	P. quadrantinodosa B. & M.		-	-	-	-	-	M	M	-	-	M	-	-
-	-	-	-	X	P. rugosa B. & M.		-	-	-	-	-	M	M	-	-	M	-	-
X	X	X	X	-	Polygnathus communis B. & M.*		-	X	X	X	X	X	X	X	X	X	-	X
-	X	-	-	-	P. communis n. var. (also in Sedalia)		-	-	-	-	-	X	X	-	X	-	-	-
-	-	X	X	-	P. inornata E. R. Branson		-	-	X	-	-	-	-	-	X	X	X	X
-	-	X	X	-	P. lobata B. & M.		-	-	X	-	-	X	X	-	X	X	-	X
-	-	-	X	-	P. longipostica B. & M.		-	-	-	-	-	-	-	-	-	X	-	-
-	-	-	-	X	P. semicostata B. & M.		-	-	-	-	-	M	M	M	-	-	-	-
-	-	-	-	X	P. varinodosa B. & M.		-	-	-	-	-	M	-	-	-	M	M	M
-	-	-	-	X	Polylophodonta confluens (U. & B.)		-	-	M	-	-	M	M	M	-	M	-	M
-	-	-	-	X	P. gyralineata (Holmes)		-	M	M	-	-	-	-	-	M	M	M	M
-	-	-	-	X	P. spp.		-	-	-	-	-	M	M	M	M	M	-	-
-	-	-	X	-	Pseudopolygnathus corrigata E. R. Branson		-	-	-	-	-	X	X	-	-	-	-	-
X	-	-	-	-	P. multistriata Mehl & Thomas		-	-	-	-	-	X	X	-	-	-	-	-
-	X	X	X	-	P. prima B. & M.		-	-	-	-	-	X	X	-	X	X	-	-
X	-	-	-	-	P. striata Mehl & Thomas		-	-	-	-	-	X	X	-	-	-	-	-
X	X	X	X	-	P. spp.		X	-	-	-	-	X	X	X	X	X	X	X
-	-	-	-	X	Roundya tumida (B. & M.)		-	-	-	-	-	-	-	-	X	-	-	-
-	-	X	X	-	Siphonodella duplicata (B. & M.)		-	-	-	-	-	X	X	X	X	X	X	X
-	-	X	X	-	S. quadruplicata (B. & M.)		-	-	X	-	-	X	X	-	-	-	-	X
-	-	-	X	X	Spathognathodus aculeatus (B. & M.)		-	-	-	-	-	-	-	X	X	X	-	-
-	-	-	-	X	S. disparilis (B. & M.)		-	-	-	-	-	-	-	-	-	M	-	-
-	-	X	-	-	Subbryantodus radians B. & M.		-	-	-	-	-	-	-	-	X	-	-	-
X	X	X	-	-	S. sp.		-	-	-	-	-	-	-	X	-	-	-	-

X = indigenous species.
M = intermixed species.

* = A Mississippian species but it occurs very rarely in U. Devonian rocks.

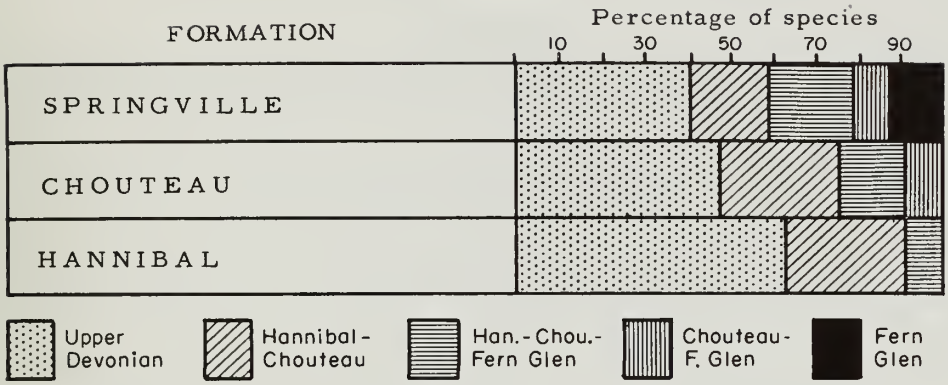


Fig. 6. - Graph illustrating the age of faunas from the Springville, Chouteau, and Hannibal Formations at State Pond. Species are grouped by known stratigraphic ranges and the percentage of species in each group is shown. Symbols identify each range-group.

SUMMARY

The Springville Shale, as defined by Savage, includes several lithologically distinct units of Kinderhook and Valmeyer age.

The limestone near the base is accepted as Chouteau and the name Darty, therefore, is no longer needed.

The Springville Shale is redefined to exclude the Chouteau Formation and the underlying gray shale (Hannibal). As redefined, the Springville Shale is entirely of Valmeyer age. There is no definite evidence concerning the precise age of the top of the Springville, but it is overlain by beds that are referred to the Burlington-Keokuk Formation. The Springville, therefore, is assigned to the Osage Group.

Conodont faunas show the lower soft shale unit of the Springville to be of lowermost Valmeyer age and equivalent to the Fern Glen Formation of west-central Illinois. As the lower shale contains the only significant faunas ever reported from the Springville, and is traceable over a large area, we are proposing for it the name "State Pond Member." The exposure at State Pond dam is designated the type section.

The gray shale underlying the Chouteau and overlying the black fissile shale has the same general physical character, stratigraphic position, and conodont fauna as the Hannibal Shale of central western Illinois. The name Hannibal, therefore, is adopted for this shale in southern Illinois.

The name Grassy Creek is applied to the black fissile shale that underlies the Hannibal, in preference to the name New Albany which was used by Workman and Gillette (1956, p. 36, fig. 18). The name New Albany, as used in southeastern Illinois, includes all strata below the base of the Chouteau and above the Sylamore. As the Hannibal Shale is recognized in this area, the black shale unit coincides more closely with the shale called Grassy Creek in western Illinois than it does with the New Albany.

The Sylamore and Grassy Creek Formations, which were tentatively referred to the Kinderhook Series by Workman and Gillette (1956), are here referred to the Upper Devonian on the basis of conodont studies by Scott in the type Kinderhook region of western Illinois. This agrees with recent studies of European sections by Bischoff (1957), Bischoff and Ziegler (1956), and others, and with earlier interpretations by Branson and Mehl (1934, p. 179).

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